SANYO Electric Biomedical Co., Ltd.

Service Manual

CO_2 Incubator
MCO-15A
MCO-15AC

SM7210146

Effective models

This service manual is effective following models

Model name	Model code	Voltage and Frequency	
MCO-15A	823 257 51	115V	60Hz
	823 257 52	220V	50Hz
	823 257 54	230V	50Hz
	823 257 55	240V	50Hz
	823 257 56	230V	50Hz
	823 257 57	240V	50/60Hz
	823 257 58	220V	50/60Hz
	823 257 59	115V	60Hz
	823 257 60	110V	60Hz
	823 257 61	220V	50/60Hz
MCO-15AC	823 273 51	115V	60Hz
	823 273 52	220V	50/60Hz
	823 273 53	220V	50/60Hz
	823 273 54	230V	50Hz
	823 273 55	240V	50/60Hz
	823 273 56	230V	50Hz
	823 273 57	240V	50Hz
	823 273 58	110V	60Hz
	823 273 59	110V	60Hz

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Features

(1) PID Temperature controls with micro-computer.
Temperature controls use PID control system with micro-computer.
PID means Proportional Integral Differential.

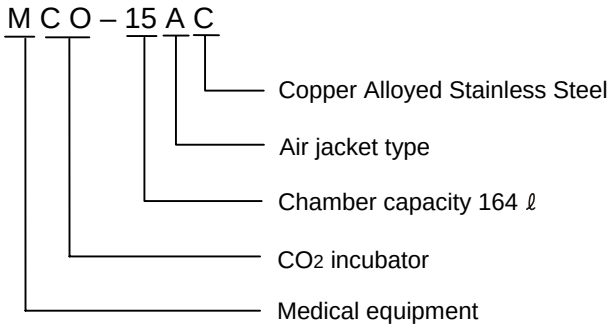
(2) Easy install.
This unit use air jacket type chamber which is no need to feed water.
It is possible easy to install and easy to maintenance.

(3) Warning system.
This model has temperature (include over heating protection) and CO_2 density alarm system.

(4) NON-CFC Insulation.
Insulation system of model MCO-15AC use NON-CFC type riged polyurethane foam in place and glass wool.

(5) Round corner.
Inside chamber made by stainless steel (SUS-304) and its corner made rounded type. It is make easy to clean-up and prefer to contamination.

Note: Model Name.



NOTICE

In general, stainless steel is known that it is not easy (hard) to rust.
However, depends on conditions, rust might generate.
When you remove rust, we recommend the following agents.
Besides, the surface may become foggy.

Recommended agent:
1. Cream cleanser [Cif] (Unilever)
2. Picasso #SUS300-W (Chemical YAMAMOTO)
<Picasso has great capability of clean for rust than Cif.>

Specifications

Name	Sanyo CO_2 Incubator	
Type	MCO-15A	MCO-15AC
Outer Dimensions	620W×685D×900H (mm)	
Inner Dimensions	490W × 505D × 665H (mm)	
Effective Capacity	164 liters	
Shelf Dimensions	450W × 450D × 10H (mm)	
Capacity of Shelves	3 (standard), 15 (maximum)	
Exterior Cabinet	Baked-on acrylic finish on galvanized steel	
Interior Cabinet	Stainless steel (SUS-304)	Stainless steel containing copper
Door	Baked-on acrylic finish on galvanized steel	
Inner Door	Tempered glass	
Shelves	Stainless steel (SUS-304)	Stainless steel containing copper
Insulation	Rigid polyurethane foam (NON-CFC) + Glass wool	
Heating Method	Air jacket	
Humidifier	Natural evaporation from humidifying pan	
Temperature Control	PID control	
CO_2 Control	ON-OFF automatic control (T.C. sensor)	
Convection in the BOX	Gentle draft	
Fan	Turbo fan (polypropylene), outer diameter 80 mm	
Fan Motor	2 polarities, Output 1W	
Filter	0.3μm, Efficiency 99.97%	
Power Source	Local voltage	
Heaters	Total 362W	
Gas Control Valve	Solenoid valve	
Warning Function	Temperature, CO_2 and the other alarm diagnosis system	
Temperature Warning Indication	More than ±1℃, the all figure of temperature flickers	
CO_2 Density Warning Indication	More than ±1%, the all figure of CO_2 flickers	
Overheat Warning	Manual set (35〜51℃), OVER HEAT lamp warning, heater OFF	
Capacity of Contact Point for Remote Alarm	None	
Output of Remote Recorder Terminal	None	
CO_2 Connecting Inlet	4〜6 mm diameter tube	
Sample Gas Collecting Outlet	4〜6 mm diameter tube	
Weight	78 kg	

ATTACHMENTS

Type	MCO-15A	MCO-15AC
Stainless Steel Shelves	3	
Supports	3 sets	
Tube for Gas	1	
Humidifying pan	1	

PERFORMANCE

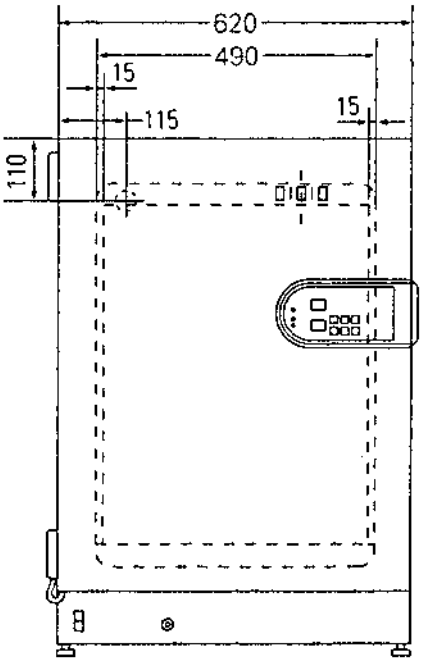
Suitable Temperature of Environmental Surrounding	0℃～35℃
Extent of Temperature in the Unit	Room temperature +5℃～50℃
Control Range of Temperature in the Unit	±0.1℃
Distribution of Temperature in the Unit	±0.2℃*
Extent of CO_2 density	0～20.0%
Range of CO_2 Regulation	±0.15%*
Humidity in the Unit	95±5% R.H. or more
Secondary Pressure of CO_2	0.03MPaG (0.3 kg/cm^{2}G)
Total Power Consumption	380W (maximum)
Noise Level	33dB (A scale)

*: Value measured at 37℃, CO_2 density of 5.0%. Ambient temperature 20℃
It is based on SANYO measuring method.

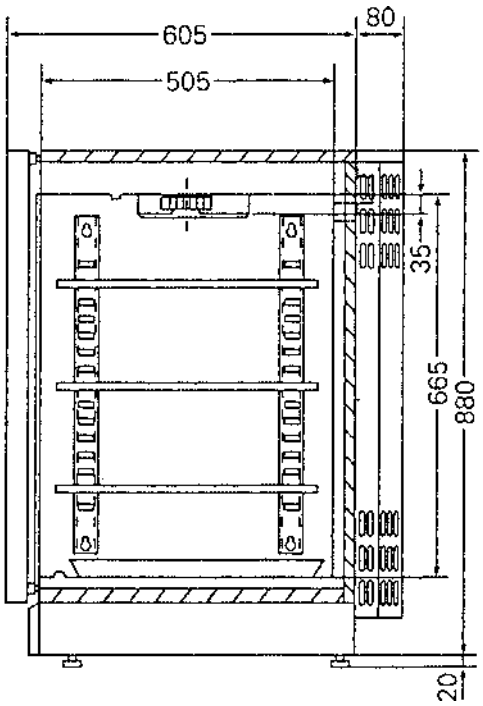
OPTIONS

CO_2 Pressure Regulator	25 MpaG (250 kg/cm^{2}G)(Primary), 0.2 MpaG (2 kg/cm^{2}G) (secondary)
Stainless Steel Shelf	The same as the attached shelf, supplied with supports
Stack Kit	MCO-17PS

Dimensions



(Unit : mm)



Electrical parts

Voltage	110 ～ 115V (60Hz)	220 ～ 240V (50/60Hz)
Power transforma	ATR－HN231UT 115V→8.5／18.0V	ATR－HN235T 230V→8.5／18.0V
Bottom heater	14.0W (3pcs.) 945Ω 115V	14.0W (3pcs.) 3779Ω 230V
Side heater(R)	22.0W 597Ω 115V	22.0W 2389Ω 230V
Side heater(L)	22.0W 597Ω 115V	22.0W 2389Ω 230V
Flange heater	45.0W 294Ω 115V	45.0W 1176Ω 230V
Back heater	23.0W 586Ω 115V	23.0W 2344Ω 230V
Back heater(sub 1)	3.0W 4.41KΩ 115V	3.0W 17.6KΩ 230V
Back heater(sub 2)	1.0W 13.2KΩ 115V	4.0W 13.2KΩ 230V
Back heater(sub 3)	1.0W 13.2KΩ 115V	4.0W 13.2KΩ 230V
Front heater	35.0W 378Ω 115V	35.0W 1511Ω 230V
Door heater (Main)	154.0W 86Ω 115V	154.0W 344Ω 230V
Door heater (Sub)	14.0W 945Ω 115V	14.0W 3779Ω 230V

Fan motor	FL2−011Y1M 1φ 110V 50/60 Hz	FL2−011Y5M 1φ230V 50/60 Hz
Power switch	AJ8202BTK AC250V 16A	AJ8202BTK AC250V 16A
Noise filter	ZCE2203−11 AC250V 3A 50/60 Hz	ZCE2203−11 AC250V 3A 50/60 Hz
Solenoid valve	FAB11−X1528 Coil:DC24V	FAB11−X1528 Coil:DC24V
Temperature control sensor	Thermistor sensor 103−AT1 (See page 14)	Thermistor sensor 103−AT1 (See page 14)
Over protect sensor	Thermistor sensor 103−AT1 (See page 14)	Thermistor sensor 103−AT1 (See page 14)
AT sensor (Ambient Temperature)	Thermistor sensor 103−AT1 (See page 14)	Thermistor sensor 103−AT1 (See page 14)
P. C. B.	CO-17A	CO-17A
Door switch	Push OFF switch SS160-A15	Push OFF switch SS160-A15
CO_2 sensor	HS−3C−S3 Thermal condictivity type OUT PUT : 5% → 5mV 20% → 20mV	HS−3C−S3 Thermal condictivity type OUT PUT : 5% → 5mV 20% → 20mV

Control specification

1. Types of Keys

BZ: When number is flashing, and buzzer sound is off

Buzzer / remote alarm output ---------- Forced ON

When number is flashing, and buzzer sound is on

Buzzer / remote alarm output ---------- Forced OFF

SET: The first time you press SET the incubator goes into temperature setting mode, the second time into CO_2 concentration setting mode, the third time into excessive temperature rise prevention/checking mode, and the fourth time it reverts to internal temperature display mode.

⏩: When you press this key in setting mode the highlighted number changes from/to the tens place, ones place and the tenths place. Also, holding this key down for about 5 seconds in internal temperature display mode activates key lock mode.

⏫: Press this key in setting mode to increase the flashing number.

ENT: Press this key in setting mode, CAL mode, or function mode to memorize the number.

CAL: Hold this key down for about 5 seconds in internal temperature display mode to switch into temperature calibration mode. Press it once again to switch to CO_2 calibration mode. Also, keying in FXX in temperature calibration mode switches to function mode.

2. Temperature Control

Setting Range: 0°C – 50°C

Method: Press SET key once, and set temperature using ⏩ and ⏫ keys. When you press ENT, the temperature setting is memorized, and the incubator goes into CO_2 setting mode.

Outside permitted range:

If you key in a temperature outside the setting range and press ENT, the buzzer sounds (for about 1 second continuously) and it stays in temperature setting mode.

Control: PID control type.

Alarm: If the internal temperature is more than 1°C higher/lower than the setting, the number flashes, and after a delay of 15 minutes the buzzer come on.

3. CO_2 Control

Setting Range: 0% – 20%

Method: Press SET twice, and set the CO_2 concentration using ⏩ and ⏫ keys. When you press ENT, the CO_2 setting is memorized, and the incubator goes into excessive temperature rise prevention/checking mode.

Outside permitted range:

If you key in a figure outside the setting range and press ENT, the buzzer sounds (for about 1 second continuously) and it stays in CO_2 setting mode.

Control: ON – OFF type

(Valve is closed if the CO_2 concentration is setting –0.02% or higher, opens if it is setting –0.06% or lower.)

Control OFF: If you set it at 0.0%, the CO_2 concentration display vanishes and control is OFF.

Alarm: If the internal concentration is more than 1% higher/lower than the setting, the number flashes, and after a delay of 15 minutes the buzzer come on.

4. Excessive Temperature Rise Prevention / Checking

Setting Range: 35°C – 51°C

Method: Press SET 3 times to display excessive temperature rise prevention setting in temperature display section, and HI in CO_2 display section.

This setting value can be changed by tuning the volume.

When you press SET again, the incubator reverts to internal temperature display mode.

5. Self-diagnostic Function

If sensors are malfunctioning or CO_2 cylinder is detected empty, an error code and the temperature are displayed alternately. Also the buzzer come on.

Error codes:

E01: CO_2 cylinder empty

E02: Internal temperature sensor wiring broken or short-circuiting

E03: CO_2 sensor output abnormality

E04: Ambient temperature sensor wiring broken or short-circuiting

Note: If two errors occur (2 error codes are generated) simultaneously, only the code for the one with the bigger number is displayed.

6. Lock Function

Key lock mode: To switch to lock mode, hold the (Shift) key down for about 5 seconds when the current internal temperature is being displayed.

When lock mode is activated " L0" is displayed in the temperature display section.

Press the (UP) key to change the key lock status.

L 1 - - - - - Lock ON

L 0 - - - - - Lock OFF

Press ENT to memorize the current condition and revert to internal temperature display mode.

7. Door Alarm

Display: When door is open - - - - - - - - - - - - - - - Door lamp ON

When door is closed - - - - - - - - - - - - - - - Door lamp OFF

Safety operation:

When the door is open, the fan motor is turned OFF, the CO_2 valve is closed, and if it stays open for more than 60 seconds the heater is also turned OFF.

8. Auto-return Function

If no keys are pressed for 90 seconds in setting mode, lock mode, or function mode, the incubator automatically exits these modes.

9. Calibration Function

Temperature: Hold the CAL key down for about 5 seconds in internal temperature display mode to switch into temperature calibration mode.

When you input the correct temperature using the and keys and press ENT, the temperature is memorized and the incubator reverts to internal temperature display mode.

CO_2: To activate CO_2 calibration mode, hold the CAL key down for about 5 seconds in internal temperature display mode to switch to temperature calibration mode, and then press the CAL key once more.

[Zero adjustment]

If you then key in 00.0 using the and keys and press ENT, the incubator memorizes the current internal concentration detected, calls it 0.0%, and reverts to internal temperature display mode.

[Span adjustment]

Alternatively, if you key in the correct concentration when CO_2 control is operational and press ENT, it memorizes this as the span calibration value and reverts to internal temperature display mode.

10. Function Mode

Function mode incorporates the following functions:

F00: ROM version display

F01: Demo (Demonstration) mode setting

F02: Humidity heater degree of energization setting

F05: CO_2 sensor output voltage (A/D input) display

F06: AT sensor temperature display

F09: Memory initialization

How to access functions:

In internal temperature display mode, hold the CAL key down for about 5 seconds to switch to temperature calibration mode. Key in desired function code in temperature display section and press ENT key.

F00: Displays the ROM version in the CO_2 display section.

F01: Sets demo mode.

Key in X1X in the CO_2 display section and press ENT to go into demo mode.

In demo mode the settings are displayed continuously, and energization of the heater / valve stops. Also, all alarms are cancelled.

To exit demo mode, key in X0X and press ENT.

(X = any number)

F02: Sets degree of energization for humidity heater's main heater.

Key in a number between 0 and 9 after the decimal point in the CO_2 display section and press ENT. The bigger the number you key in, the greater the degree of energization, the higher the internal humidity.

F05: Displays the CO_2 sensor input voltage (A/D input)

Displays the CO_2 sensor input voltage in the CO_2 display section. Unit = [V]

F06: Displays the external air temperature detected by the sensor.

F09: Initializes the CO_2 calibration value and the non-volatile memory.

Key in XX5 in the CO_2 display section and press ENT key to initialize the CO_2 zero adjustment value and the span adjustment value.

Key in XX9 in the CO_2 display section and press ENT key to initialize all the data in the non-volatile memory.

The initial values in the non-volatile memory are as follows:

Temperature setting:	37.0°C
CO_2 setting:	0.0%
Humidity heater balance:	5
Temperature zero adjustment data:	0.0
CO_2 zero adjustment data:	0.0
CO_2 span data:	1.0
Key lock data:	Key lock OFF
Demo data:	Demo OFF

This function is used when non-volatile data has been destroyed as a result, for example, of unavoidable noise, and cannot be repaired/recovered. Hence, it is not used in normal circumstances.

11. Humidity Heater Control

The humidity heater is energized, as described below, in order to reduce humidity recovery time.

If the internal temperature is between SV–0.4 and SV–0.8 degrees, the humidity heater is energized continuously for a maximum of 5 minute. In all other circumstances, it is energized according to the degree of energization set using F02.

However, it is not energized continuously in the following circumstances:

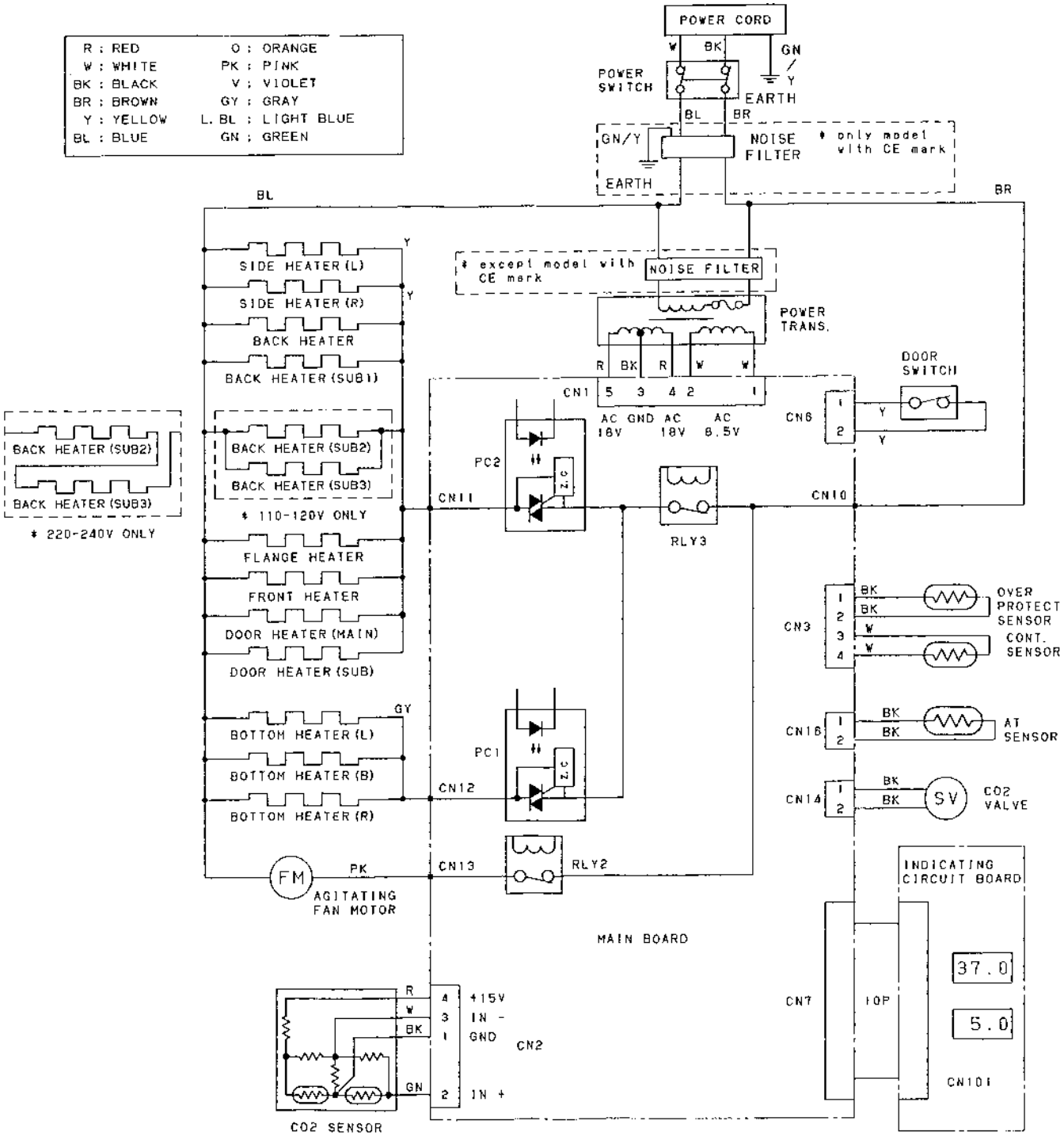
1) After the power is switched on, until the internal temperature reaches the (–0.2 degrees) setting.
2) After the door has been open for more than 60 seconds, until the internal temperature reaches the (–0.2 degrees) setting.

12. Offset

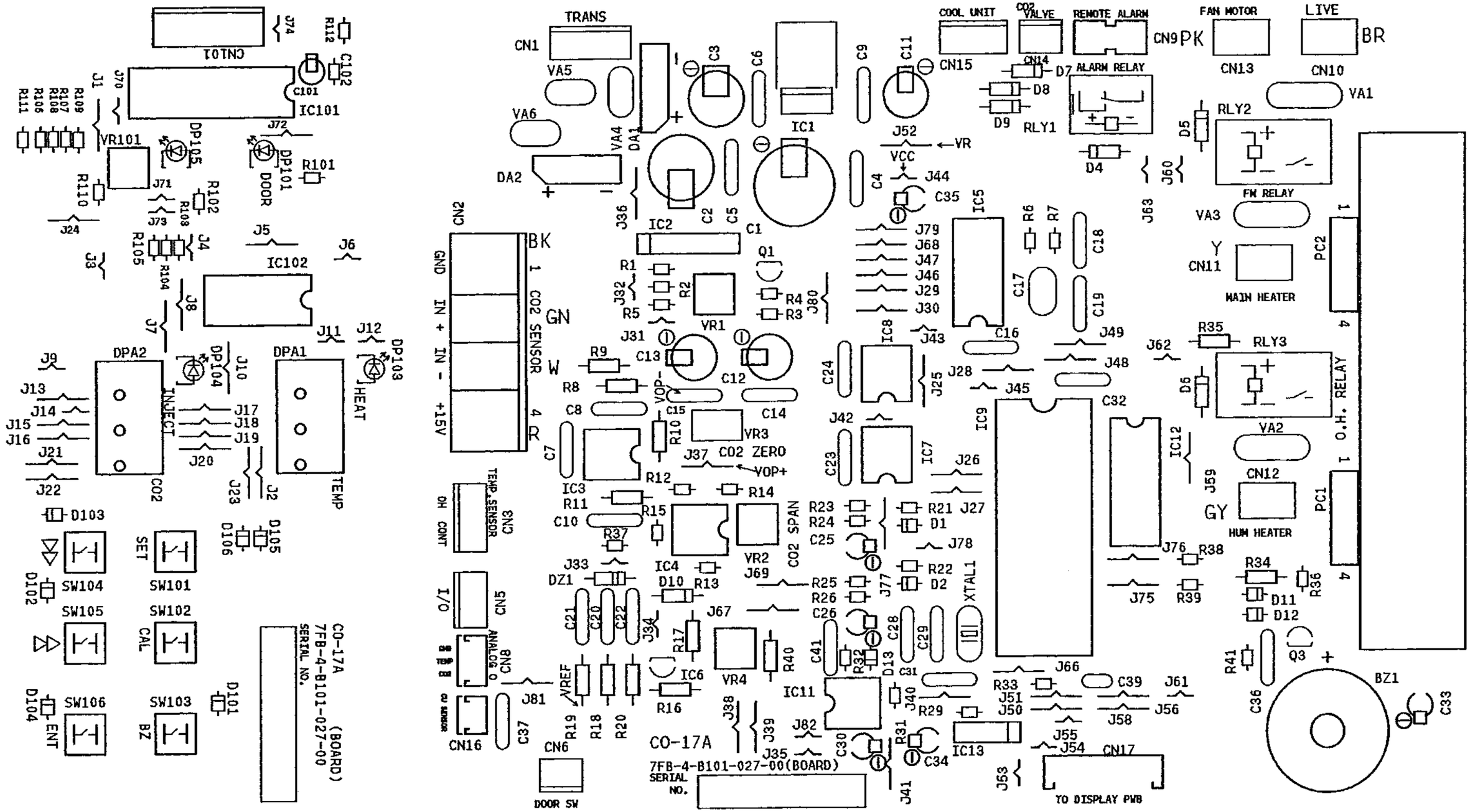
In order to compensate for the difference between the temperature detected by the temperature control sensor and centre of internal chamber temperature, the following offset is applied:

Detected temperature + 0.4 degrees

Circuit diagram



Components on P.C.B.



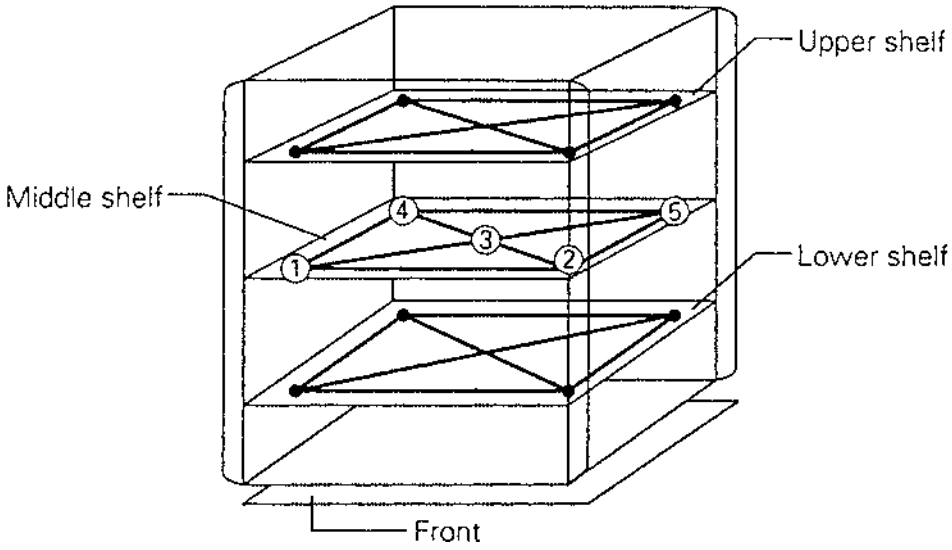
Specification of sensor

■ The following shows temperature and resistance characteristics on thermistor sensor 103AT-1.

Temperature (℃)	Resistance (kΩ)	Temperature (℃)	Resistance (kΩ)	Temperature (℃)	Resistance (kΩ)
0	27.28	17	13.57	34	7.19
1	26.13	18	13.06	35	6.94
2	25.03	19	12.56	36	6.70
3	23.99	20	12.09	37	6.47
4	22.99	21	11.63	38	6.25
5	22.05	22	11.20	39	6.03
6	21.15	23	10.78	40	5.83
7	20.29	24	10.38	41	5.63
8	19.48	25	10.00	42	5.44
9	18.70	26	9.63	43	5.26
10	17.96	27	9.28	44	5.08
11	17.24	28	8.94	45	4.91
12	16.55	29	8.62	46	4.75
13	15.90	30	8.31	47	4.59
14	15.28	31	8.02	48	4.44
15	14.68	32	7.73	49	4.30
16	14.12	33	7.46	50	4.16

Test data

▪ Temperature uniformity



Test condition

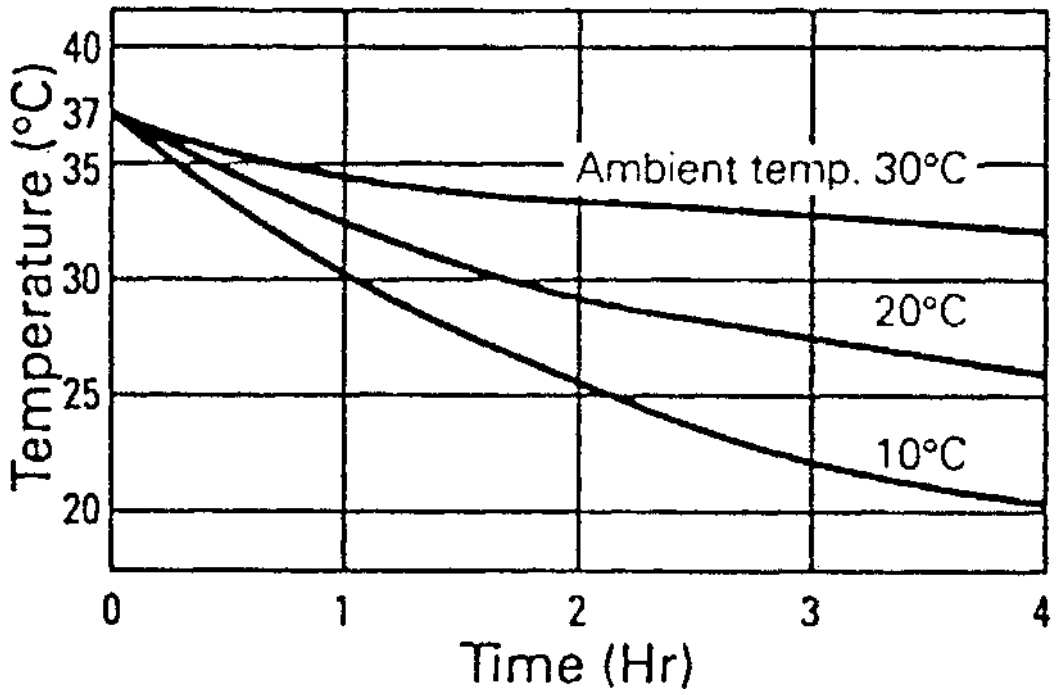
- Ambient temperature :20 ℃
- Ambient humidity :45%RH
- CO_2 level setting :5.0%
- Water in humidity pan :2 ℓ

Shelf position \ Measurement position	①	②	③	④	⑤
Upper Shelf	+0.05	+0.07	0.00	–0.15	+0.05
Middle Shelf			0.00		
Lower Shelf	+0.05	–0.02	–0.05	–0.03	+0.02

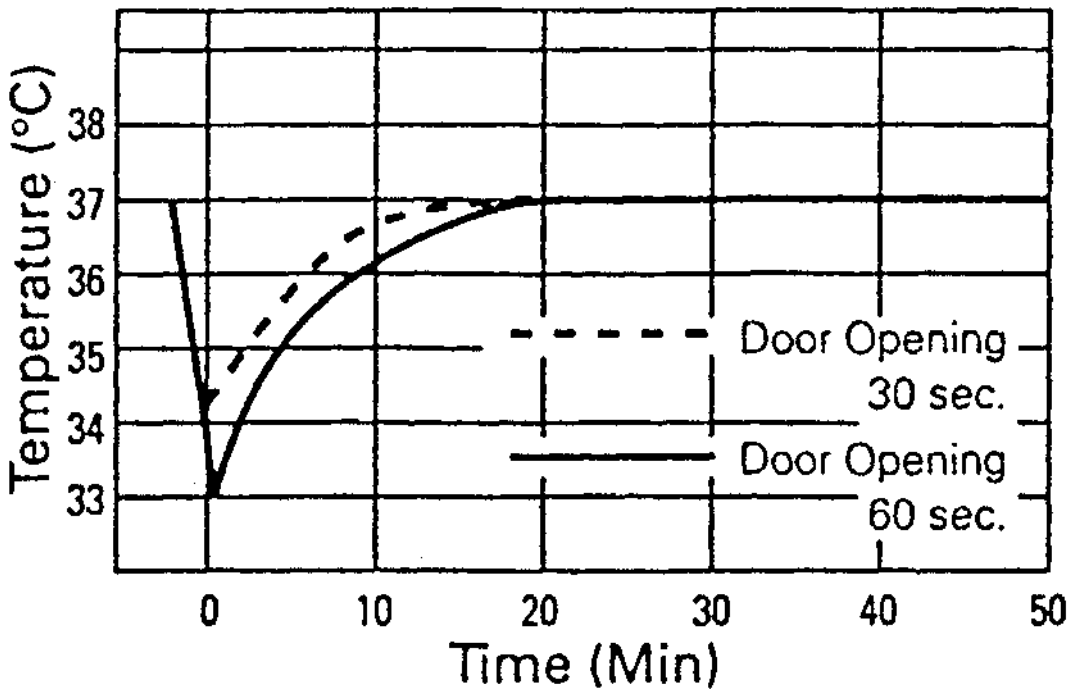
Note: This data does not represent a guarantee of product performance.

Test data

Temperature decrease characteristics when power failure occurs

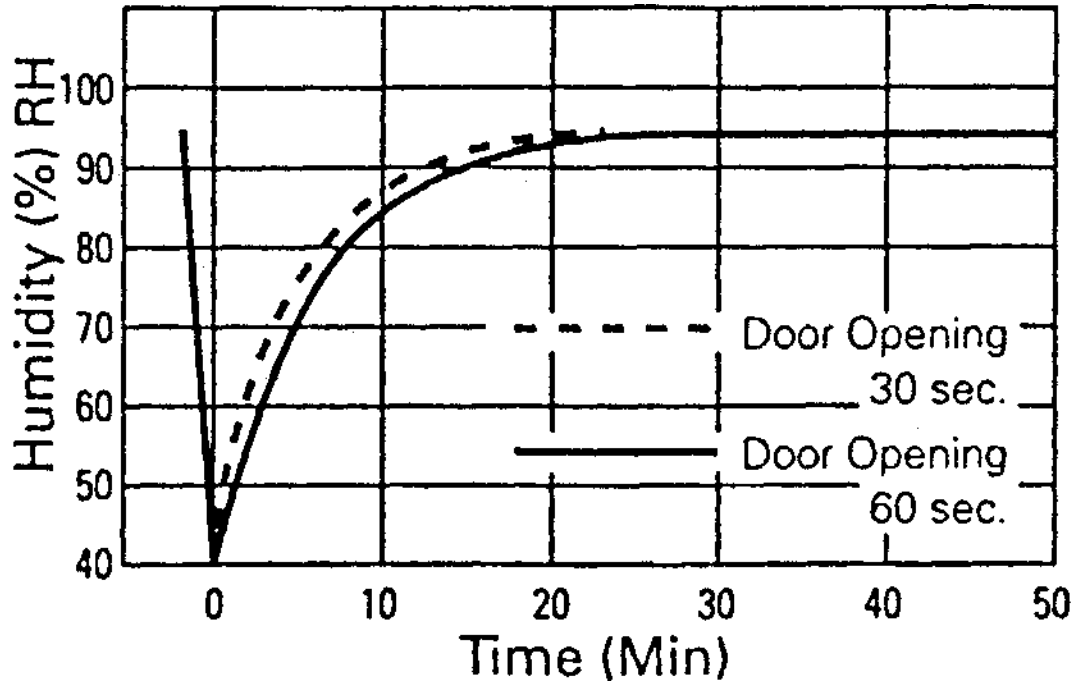


Temperature Recovery Characteristics

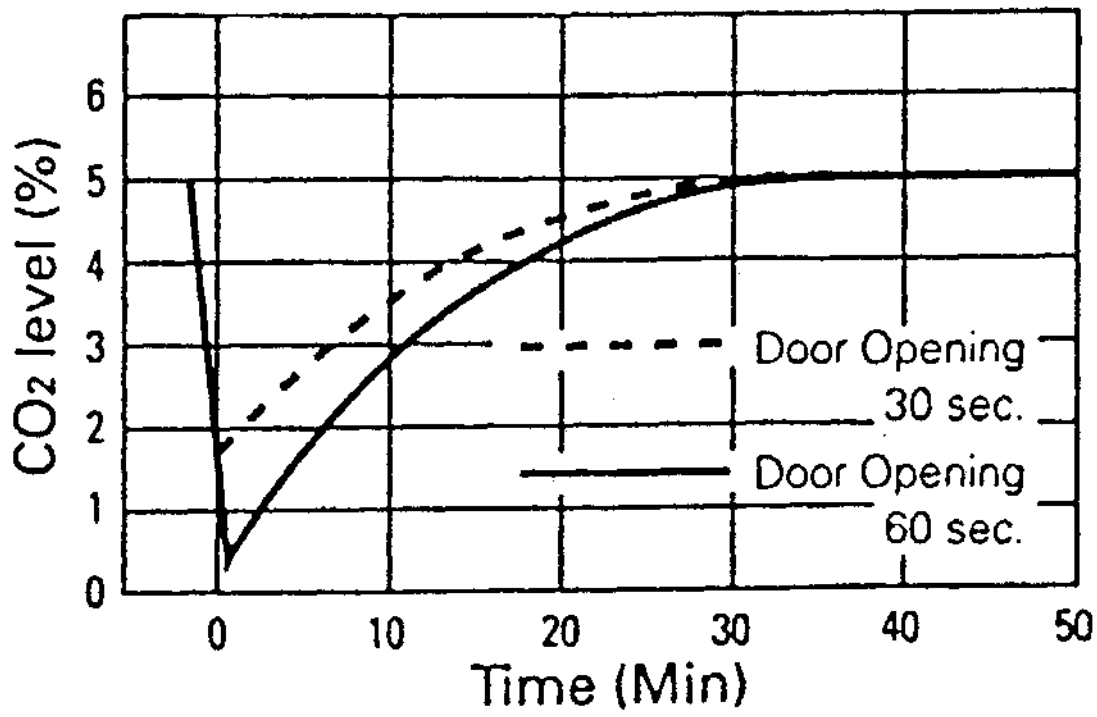


Test data

Humidity Recovery Characteristics



CO_2 Level Recovery Characteristics



User's manual

- This section is extracted and printed from User's Manual.

- If you find out "Refer to page ●●" in them, this page means not page in service manual but page in the lower corner of each page in the extract from user's manual.
  This page number is not corresponded with serial number in Service manual.

SANYO

INSTRUCTION MANUAL

MCO-15AC

CO_2 Incubator

Note:

1. No part of this manual may be reproduced in any form without the expressed written permission of SANYO.

2. The contents of this manual are subject to change without notice.

3. Please contact SANYO if any point in this manual is unclear or if there are any inaccuracies.

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PRECAUTIONS FOR SAFE OPERATION

It is imperative that the user complies with this manual as it contains important safety advice.

Items and procedures are described so that you can use this unit correctly and safely. If the precautions advised are followed, this will prevent possible injury to the user and any other person.

Precautions are illustrated in the following way:

⚠WARNING

Failure to observe WARNING signs could result in a hazard to personnel possibly resulting in serious injury or death.

⚠CAUTION

Failure to observe CAUTION signs could result in injury to personnel and damage to the unit and associated property.

Symbol shows;

△ this symbol means caution.

⃠ this symbol means an action is prohibited.

● this symbol means an instruction must be followed.

Be sure to keep this manual in a place accessible to users of this unit.

PRECAUTIONS FOR SAFE OPERATION

⚠WARNING

Do not use the unit outdoors. Current leakage or electric shock may result if the unit is exposed to rain water.

Only qualified engineers or service personnel should install the unit. The installation by unqualified personnel may cause electric shock or fire.

Install the unit on a sturdy floor. If the floor is not strong enough or the installation site is not adequate, this may result in injury from the unit falling or tipping over.

Never install the unit in a humid place or a place where it is likely to be splashed by water. Deterioration of the insulation may result which could cause current leakage or electric shock.

Never install the unit in a flammable or volatile location. This may cause explosion or fire.

Never install the unit where acid or corrosive gases are present as current leakage or electric shock may result due to corrosion.

Use a dedicated power source as indicated on the rating label attached to the unit.

Remove dust from the power supply plug before inserting in a power source. A dusty plug or improper insertion may pose a hazard.

Use a power supply outlet with ground (earth) to prevent electric shock. If the power supply outlet is not grounded, it will be necessary to install a ground by qualified engineers.

Never ground the unit through a gas pipe, water main, telephone line or lightning rod. Such grounding may cause electric shock in the case of an incomplete circuit.

Check the gas type and ensure that it is fit for the purpose. Make sure that all pipes are connected correctly and are not liable to become disconnected. Ensure that the gas pressure is set at the specified value. Improper connection of the gas pipe or use of incorrect gas pressure may result in leakage of CO_2 gas. Elevated level of CO_2 gas can be hazardous to health and may lead to asphyxiation and risk of death.

Do not insert metal objects such as a pin or a wire into any vent, gap or any outlet for inner air circulation. This may cause electric shock or injury by accidental contact with moving parts.

Never store volatile or flammable substances in this unit. This may cause explosion or fire.

PRECAUTIONS FOR SAFE OPERATION

⚠WARNING

As with any equipment that uses CO_2 gas, there is a likelihood of oxygen depletion in the vicinity of the equipment. It is important that you assess the work site to ensure there is suitable and sufficient ventilation. If restricted ventilation is suspected, then other methods of ensuring a safe environment must be considered. These may include atmosphere monitoring and warning devices.

Ventilate a room air occasionally when using CO_2 gas for control. The gas density will increase in an enclosed small room and high level of gas density is harmful for human. In addition, avoid inhaling the chamber air directly when opening the door if CO_2 gas is used.
Si l'appareil est utilisé dans un evdroit restreint, le niveau de la densité CO_2 de l'air peut s'élever et peut être nocif aux humains. Évitez d'aspirer l'air provenant de l'intérieur de l'appareil quand vous ouverz la porte.

Use this unit in safe area when treating the poison, harmful or radiate articles. Improper use may cause bad effect on your health or environment.

Disconnect the power supply to the unit prior to any repair or maintenance of the unit in order to prevent electric shock or injury.

Ensure you do not inhale or consume medication or aerosols from around the unit at the time of maintenance. These may be harmful to your health.

Never splash water directly onto the unit as this may cause electric shock or short circuit.

Never disassemble, repair, or modify the unit yourself. Any such work carried out by an unauthorized person may result in fire or injury due to a malfunction.

Disconnect the power supply plug if there is something wrong with the unit. Continued abnormal operation may cause electric shock or fire.

If the unit is to be stored unused in an unsupervised area for an extended period, **ensure that children do not have access and that doors cannot be closed completely.**

The disposal of the unit should be accomplished by appropriate personnel. Remove doors to prevent accidents such as suffocation.

Prepare a safety check sheet when you request any repair or maintenance for the safety of service personnel.

PRECAUTIONS FOR SAFE OPERATION

⚠CAUTION

Select a level and sturdy floor for installation. This precaution will prevent the unit from tipping. Improper installation may result in water spillage or injury from the unit tipping over.

Connect the unit to a power source as indicated on the rating label attached to the unit. Use of any other voltage or frequency other than that on the rating label may cause fire or electric shock.

Fix the tray supports and trays securely. Incomplete installation may cause injury or damage.

When removing the plug from the power supply outlet, grip the power supply plug, not the cord. Pulling the cord may result in electric shock or fire by short circuit.

Never damage or break the power supply plug or cord. Do not use the supply plug if its cord is loose. This may cause fire or electric shock.

Do not touch any electrical parts such as the power supply plug or any switches with a wet hand. This may cause electric shock.

Do not put a container with water or heavy articles on the unit. It may cause injury if the articles fall. Current leakage or electric shock may be resulted form the deterioration of insulation by spilled water.

Do not climb onto the unit or do not put articles on the unit. This may cause injury by tipping or damage to the unit.

Never lean or press on the glass. Intentional force may cause injury if the glass breaks.

Do not lean on the door. This may cause injury, current leakage, or electric shock if the unit tips over or door drops out.

Disconnect the power supply plug before moving the unit. Take care not to damage the power cord. A damaged cord may cause electric shock or fire.

Empty the humidifying pan completely before moving the unit. Spilled or splashed water may cause current leakage or electric shock.

Be careful not to tip over the unit during movement to prevent damage or injury.

Disconnect the power plug when the unit is not used for long periods.

Do not put the packing plastic bag within reach of children as suffocation may result

5

CAUTIONS FOR USAGE

1. 5°C higher than the ambient temperature

The chamber temperature must be at least 5°C higher than the ambient temperature. For example, the chamber temperature is set to 37°C, the ambient temperature must be less than 32°C. Keep the ambient temperature in adequate range.

2. CO_2 sensor

The CO_2 sensor used in this unit is influenced by humidity because of thermal conductivity type. The higher CO_2 density than actual one is displayed when the humidity in the chamber is decreased, resulted from door opening. This is not a failure. The display will indicate correct value after overcoming the humidity.

3. Do not subject to direct air flow

Do not allow the air for air conditioning to hit the unit or door directly. Direct hit may cause condensation or contamination.

4. Allow adequate space between the cultures

When storing cultures in the chamber, keep the Petri dishes or bottles containing the cultures sufficiently apart from each other to allow adequate air circulation. Inadequate space may result in uneven temperature distribution and CO_2 concentration in the chamber.

5. Connect a pressure regulator to the gas cylinder

A pressure regulator must be installed when connecting the CO_2 gas cylinder to this unit. This work should be done by a qualified personnel. A regulator rated at 24.5Mpa on the primary side and 196Kpa on the secondary side is recommended. Also, use CO_2 gas having a high level of purity.

6. Always keep the chamber clean

The Petri dishes or bottles for culturing may cause contamination in the chamber. Clean the containers before storing them in the chamber.

7. Keep the inside panels dry

To protect the inside of the unit from contamination, the inside panels should always be kept dry. If water is spilled from a humidifying pan or if the door is kept open for a long period, condensation will form on the panels, allowing germs to breed. In such a case, wipe away the water with a dry sterile gauze. Particularly, if the medium is spilled, wipe it up immediately and sterilize the area.

8. Fill the humidifying pan with sterile distilled water

Always use sterile distilled water to fill the pan. Check the water level every day and replenish the water promptly if the level is low. Note that when low temperature water is poured, the chamber temperature drops significantly. Set the pan properly so that the shorter edges are positioned in the front and back. Improper setting may cause faulty humidifying or condensation. Also, clean the pan once a month.

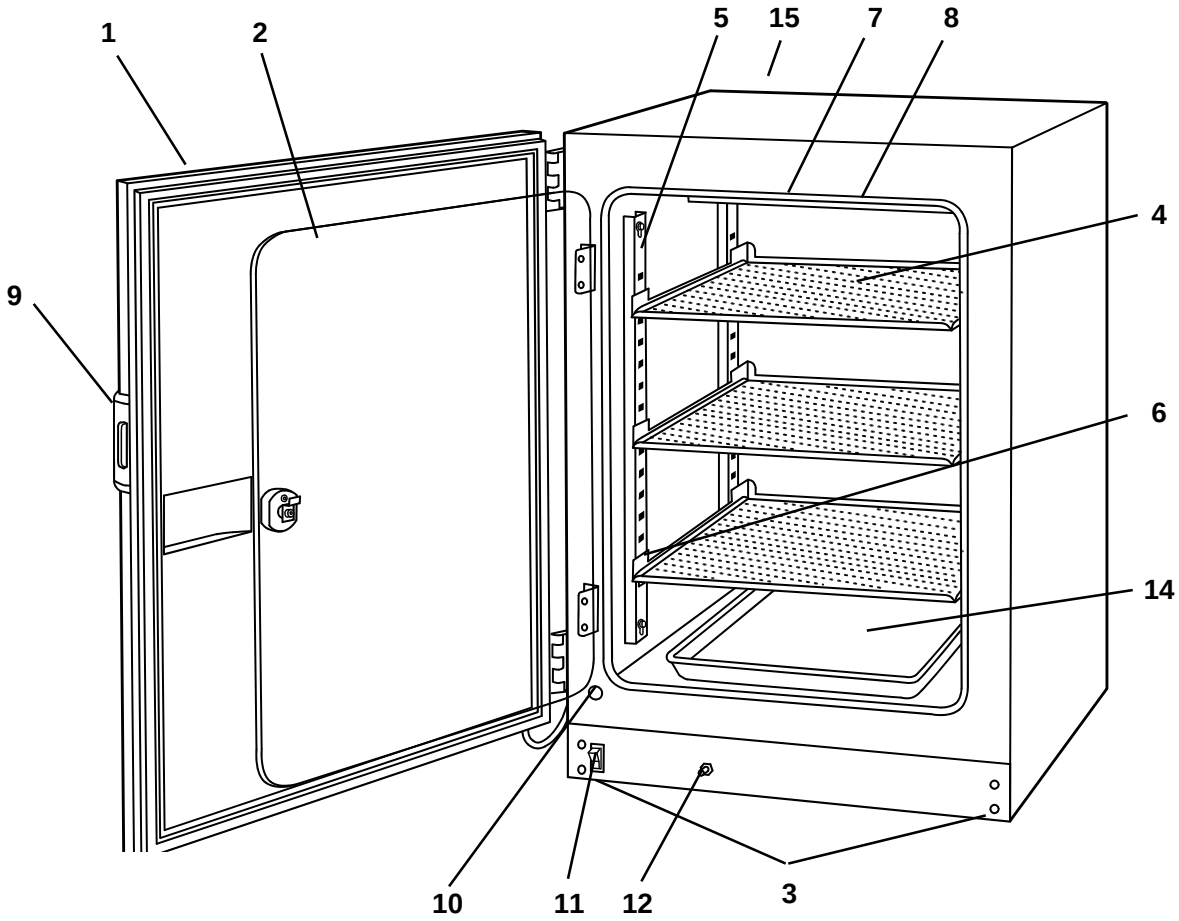
9. Always shut the inner door

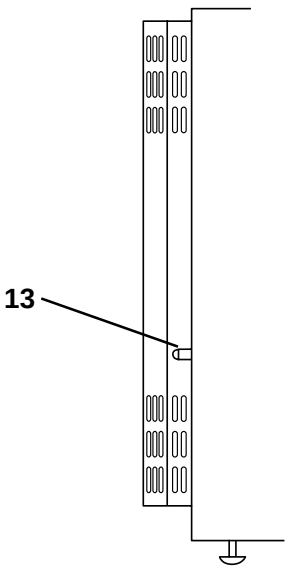
Shut the inner door completely, and then shut the door. If the inner door is not closed completely, even if the door is closed, the unit will fail to exhibit its maximum performance. And close the doors gently. Rude closing may cause spillage of medium, incomplete closing, or damage of gasket.

10. Stacked module

When the product is used in stacked module, make sure to fix the unit by using the optional kit (MCO-17PS).

INCUBATOR COMPONENTS (MCO-15AC)





Back side

9

INCUBATOR COMPONENTS (MCO-15AC)

1. Outer door: Sticks to frame with magnetic packing. Door heater is installed in the door panel. The heater eliminates moisture on the inner door.

2. Inner door: Made of tempered glass. The inner door is removable for cleaning and disinfection.

3. Leveling feet: Used for leveling the unit. This is a screw type and when it is turned to clockwise, the leg becomes shorter.

4. Tray: Made of copper alloy resistant to contamination. Trays can be easily removed from the unit to be cleaned or disinfected.

5. Side panel: Right and left side panels are removal for cleaning and disinfection.

6. Tray support: 5 supports can be attached to each side (right and left). They can be removed after removing trays for cleaning and disinfection.

7. Top panel: Located on the ceiling of the chamber. This covers a circulating fan, CO_2 sensor, high temperature alarm sensor, and temperature control sensor. The panel is removal for cleaning and disinfection.

8. Fan (inside the top panel): For circulating the chamber air to distribute the gas equally. The fan is removal for cleaning and disinfection.

9. Control panel (on the door): See page 15 for the operation.

10. Door switch: When the door is opened, this switch stops the fan and the supply of CO_2 gas.

11. Power switch: Main ON-OFF switch for all power.

12. Sample air outlet: For taking out the chamber air for sampling. This also functions as an internal gas outlet, so do not cap it.

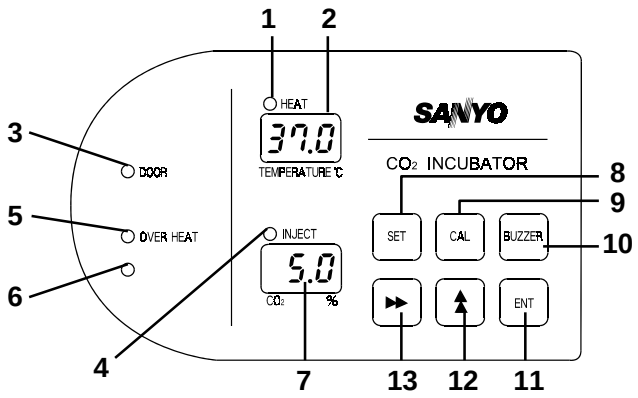
13. Gas pipe connector (on the back side): For connecting CO_2 gas pipe. See page 14.

14. Humidifying pan: Use the sterile distilled water to fill the pan. The humidifying heater is provided at the bottom of the chamber. Install the pan properly to keep appropriate performance. See item 8 on page 6.

15. Access port: Positioned at upper left corner of the chamber. For passing through the cable or wire of outside equipment.

INCUBATOR COMPONENTS

Control panel and keypad



1. Heater lamp (HEAT): This lamp lights when the heater is energized.

2. Digital temperature indicator (TEMPERATURE °C): Normally, this indicator shows the chamber temperature. In the setting mode, it shows the set value of the chamber temperature. If the self diagnostic function detects any abnormality, an error code will be displayed.

3. Door lamp (DOOR): This lamp lights when the door is open.

4. CO_2 inject lamp (INJECT): This lamp lights when CO_2 gas is being supplied.

5. Over heat lamp (OVER HEAT): This lamp lights when the chamber temperature reaches the upper limit set value.

6. Upper limit regulator: This regulator is used to set the upper limit temperature.

7. Digital CO_2 density indicator (CO_2 %): Normally, this indicator shows the CO_2 concentration in the chamber. In the setting mode, it indicates the set value of the CO_2 concentration.

8. Set key (SET): By pressing this key, the unit enters the setting mode, and the digits that can be set flash.

9. Calibration key (CAL): By pressing this key for 5 seconds, the unit enters the calibration mode. Refer to page 21 “Calibration” for details.

10. Alarm buzzer stop key (BUZZER): Press this key to silence the buzzer when the alarm operates and the buzzer sounds. Press it once again to reactivate the buzzer.

11. Enter key (ENT): Pressing this key memorizes the set value in the controller.

12. Numerical value shift key (▲): Pressing this key in the setting mode causes the numerical value to shift. In key lock mode, pressing this key makes key lock ON or OFF.

13. Digit shift key (▶▶): Pressing this key in the setting mode causes the changeable digit to shift. Pressing this key more than 5 seconds enters to key lock mode. See page 16.

11

INSTALLATION

Installation site

To operate this unit properly and to obtain maximum performance, install the unit in a location with the following conditions:

Note: The ambient temperature must be at least 5ºC lower than the set temperature.

1. A location not subjected to direct sunlight or direct air flow from an air conditioner

2. A location with clean air and adequate ventilation (Small and sealed room is not recommended.)

> ⚠ **WARNING**
>
> **If the unit is used in a small confined room, the CO_2 density level in the air could rise and may be harmful to humans.**
> **Si l'appareil est utilisé dans un evdroit restreint, le niveau de la densite CO_2 de l'air peut s'élever et peut être nocif aux humains. Evitez d'aspirer l'air provenant de l'inérieur de l'appareil quand vous ouverz la porte.**

3. A location away from heat generating sources

4. A location with a sturdy and level floor

> ⚠ **WARNING**
>
> **Install the unit on a sturdy floor.** If the floor is not strong enough or the installation site is not adequate, this may result in injury from the unit falling or tipping over.
> **Select a level and sturdy floor for installation.** This precaution will prevent the unit from tipping. Improper installation may result in water spillage or injury from the unit tipping over.

5. A location without flammable or corrosive gas

> ⚠ **WARNING**
>
> **Never install the unit in a flammable or volatile location.** This may cause explosion or fire.
> **Never install the unit where acid or corrosive gases are present** as current leakage or electric shock may result due to corrosion.

6. A location not prone to high humidity

> ⚠ **WARNING**
>
> **Do not use the unit outdoors.** Current leakage or electric shock may result if the unit is exposed to rain water.
> **Never install the unit in a humid place or a place where it is likely to be splashed by water.** Deterioration of the insulation may result which could cause current leakage or electric shock.

INSTALLATION

Prevent contamination

To prevent contamination of the chamber, select an appropriate location for installation as well as the complete disinfection of the chamber components.

1. Avoid hot and humid location
Avoid location with high temperature and/or humidity as the presence of bacteria in the air is greater than in normal environment.

2. Avoid drafty location and location with many passers-by
Avoid locations near doors, air conditioners, fans, etc., where slight breezes can facilitate the entry of bacteria into the chamber.

3. Installation in a sterile room
To get the cultivation more efficiently, install the unit in a sterile room.

4. Use clean containers
The contamination is mainly caused by the containers such as Petri dishes or bottles stored in the chamber. Always keep the containers clean.

Installation

1. Remove the packaging materials and tapes
Remove all transportation packaging materials and tapes. Open the doors and ventilate the unit. If the outside panels are dirty, clean them with a neutral detergent and wipe it up with a wet cloth.

2. Adjust the leveling feet
Extend the leveling feet by rotating them counterclockwise to contact them to the floor. Ensure the unit is level.

3. Fix the unit
Two fixtures are attached to the rear of the frame. Fix the frame to the wall with these hooks and rope or chain.

4. Ground (earth)

⚠WARNING

Use a power supply outlet with ground (earth) to prevent electric shock. If the power supply outlet is not grounded, it is necessary to install a ground by qualified engineers.
Never ground the unit through a gas pipe, water main, telephone line or lightning rod. Such grounding may cause electric shock in the case of an incomplete circuit.

BEFORE COMMENCING OPERATION

Connection of CO_2 gas cylinder

⚠WARNING

Check the gas type and ensure that it is fit for the purpose. Make sure that all pipes are connected correctly and are not liable to become disconnected. Ensure that the gas pressure is set at the specified value. Improper connection of the gas pipe or use of incorrect gas pressure may result in leakage of CO_2 gas. Elevated level of CO_2 gas can be hazardous to health and may lead to asphyxiation and risk of death.

Use a liquefied CO_2 gas cylinder, not a siphon (dip tube) type. The CO_2 gas should be 99.5% or more pure.

Install a pressure regulator on the cylinder. Use a regulator rated at 25Mpa on the primary side and 0.2Mpa on the secondary side. Use the following procedure to attach the incubator to the cylinder:

1. Using the gas supply pipe provided, connect the pressure regulator to the CO_2 inlet located at the rear left hand side of the CO_2 incubator.

2. Set the CO_2 pressure on the secondary side to 0.03Mpa. Excessive pressure may cause disconnection of internal pipes inside the CO_2 incubator which will result in leakage of CO_2 gas into the atmosphere. **Elevated level of CO_2 gas can be hazardous to health and may lead to asphyxiation and risk of death.**

3. Check that no gas is leaking at any point where the pipe connects with the CO_2 regulator or the CO_2 incubator.

Note:

The incubator, including the gas supply pipes and services must be examined at frequent intervals to ensure they are sage. Ensure that items such as pipes are replaced if there is any sign of deterioration.

Sterilizing of chamber and attachments

Before first start-up of the unit, the chamber and internal attachments should be cleaned and sterilized as follows.

1. Remove the all attachments and accessories in the chamber by following the procedure on page 20.

2. Clean the all attachments (including sensors inside the top plate) and accessories with neutral detergent and then wash out the detergent with distilled water.

3. Wipe the attachments and accessories with a gauze containing alcohol for sterilization and then wipe off with a dry gauze.

4. Wipe the inside wall of the with a gauze containing alcohol for sterilization and then wipe off with a dry gauze.

5. Replace all attachments and accessories in the chamber.

6. Fill the humidifying pan with the sterile distilled water.

Note:

Do not clean the inside of the unit with a solution of disodium chlorate or other halogen-based solution because this may cause rust.

Set of chamber temperature and CO_2 density

Table below shows the basic procedure for setting the chamber temperature and CO_2 density. The upper limit alarm temperature setting is also shown in the table. Perform key operations in the sequence indicated in the table. The example in the table is based on the assumption that the desired temperature is 37°C and CO_2 density is 5%.

Note: The unit is set at the factory so that the chamber temperature is 37°C and CO_2 control is 0%.

Allow at least 8 hours until the next setting after setting of desired chamber temperature and setting CO_2 density to 0%, at the time of first start-up or start-up after no use for long term.

Basic operation sequence (Example: Chamber temperature; 37°C, CO_2 density; 5%)

	Description of operation	Key operated	Indication after operation
1	Turn the power switch ON.	----	The current chamber temperature is displayed in temperature indicator.
2	Press SET key.	SET	The left digit is flashed.
3	By pressing ▶▶ key and ▲▲ key, set the figure to 37.0.	▶▶	When pressed, the changeable digit is shifted.
		▲▲	When pressed, the figure of settable digit increases.
4	Press ENT key.	ENT	Set temperature is memorized. Left digit in CO_2 density indicator is flashed.
5	By pressing ▶▶ key and ▲▲ key, set the figure to 05.0.	▶▶	When pressed, the changeable digit is shifted.
		▲▲	When pressed, the figure of settable digit increases.
6	Press ENT key.	ENT	Set CO_2 density is memorized.
7	Adjust upper alarm temperature set knob so that the alarm temp. is 1°C higher than chamber temp.		In CO_2 density indicator, HI is displayed. In temperature indicator, 38.0 is displayed.
8	Press ENT key.	ENT	This is the end of set mode and the indicators display current temperature and CO_2 density.

Note:

In each set mode, the indicator returns to the current temperature and CO_2 density display mode automatically when 90 seconds has passed without any key operation.

In each set mode, if the change setting is not necessary, pressing SET key skips to next set mode.

When the CO_2 density is set to 00.0, the control is OFF with regardless of chamber density.

The upper limit alarm temperature set value will change when the set knob is turned even if the unit is not in set mode, because the alarm circuit is an independent circuit.

Key lock function

This unit is provided with the key lock function. When the key lock is ON, change of temperature or CO_2 density setting through the key pad is not available.

Note: The key lock is set in OFF at the factory.

Display	Mode	Function
LO	Key lock is OFF	Enable to change of temperature setting
L1	Key lock is ON	Disable to change of temperature setting

Procedure for key lock setting (change from key lock OFF to key lock ON)

	Description of operation	Key operated	Indication after operation
1		----	The current chamber temperature is displayed.
2	Press ▶▶ key for 5 seconds.	▶▶	LO is displayed in the temperature indicator. LO
3	Press ▲▲ key and scroll the figure to 1.	▲▲	When pressed, the figure of settable digit increases. L1
4	Press ENT key.	ENT	The key lock is set to ON. The current chamber temperature is displayed.

ALARMS & SAFETY FUNCTIONS

This unit has the alarms and safety functions shown in table below, and also self diagnostic functions.

Alarms and safety functions

Alarm & Safety	Situation	Indication	Buzzer	Safety operation
Upper limit temperature alarm	If the chamber temperature exceeds the upper limit alarm temperature set value.	Over heat lamp lights.	Continuous tone	Heater OFF
Automatic set temperature alarm	If the chamber temperature deviates from the set temperature by ±1°C or more.	All digits on the temperature indicator flash.	Intermittent tone with 15 minutes delay.	-----
Automatic set CO_2 density alarm	If the chamber CO_2 density deviates from the set value by ±1% or more.	All digits on the CO_2 density indicator flash.	Intermittent tone with 15 minutes delay.	-----
Auto-return	When there is no key pressing in each setting mode for 90 seconds.	Normal display mode.	-----	The setting mode is canceled.
Key lock	When the key lock is "ON".	-----	-----	The setting is disabled.
CO_2 gas cylinder empty	If the CO_2 density does not increase when the gas valve is opened.	E01 is displayed alternately with the temperature on the temperature indicator.	Intermittent tone	-----
Temperature sensor abnormality	If the temperature sensor goes open circuit or short circuit.	E02 is displayed alternately with the temperature on the temperature indicator.	Intermittent tone	Heater OFF
CO_2 sensor abnormality	If the output voltage of the CO_2 sensor is abnormal.	E03 is displayed alternately with the temperature on the temperature indicator.	Intermittent tone	The CO_2 valve close.

Note:

The upper limit temperature alarm cannot be silenced with the BUZZER key.

E01 is cleared automatically when the gas is connected correctly and the buzzer is silenced with the BUZZER key.

If either E02 or E03 is emitted, consult with the shop where you purchased the unit.

ROUTINE MAINTENANCE

⚠WARNING

Always disconnect the power supply to the unit prior to any repair or maintenance of the unit in order to prevent electric shock or injury.
Ensure you do not inhale or consume medication or aerosols from around the unit at the time of maintenance. These may be harmful to your health.

⚠CAUTION

Always put on the dry gloves to protect the hands at the time of maintenance. No gloves may cause cut of the finger by the edge or corner.

Sterilizing of chamber and attachments

When the chamber of the unit is contaminated, the chamber and internal attachments should be cleaned and sterilized as follows.

1. Remove the all attachments and accessories in the chamber by following the procedure on page 20.

2. Clean the all attachments (including sensors inside the top panel) and accessories with neutral detergent and then wash out the detergent with distilled water.

3. Wipe the attachments and accessories with a gauze containing alcohol for sterilization and then wipe off with a dray gauze.

4. Wipe the inside wall of the with a gauze containing alcohol for sterilization and then wipe off with a dray gauze.

5. Replace all attachments and accessories in the chamber.

6. Fill the humidifying pan with the sterile distilled water.

Note:
Do not clean the inside of the unit with a solution of disodium chlorate or other halogen-based solution because this may cause rust.

Cleaning of outside

1. Clean the unit once a month. Regular cleaning keeps the unit looking new.

2. Use a dry cloth to wipe off small amounts of dirt on the outside. If the unit is very dirty, use a neutral detergent.

3. After cleaning, wipe away the cleaner completely with a cloth washed in clean water.

4. Never pour water onto or into the unit. Water can cause the electric shock or short circuit.

ROUTINE MAINTENANCE

Removal of attachments

1. Close the tap of the gas cylinder and turn off the power.

2. Open the outer door. Then open the inner door slightly and lift to remove it. See Fig. 1

3. Pull out the humidifying pan and trays. See Fig. 2

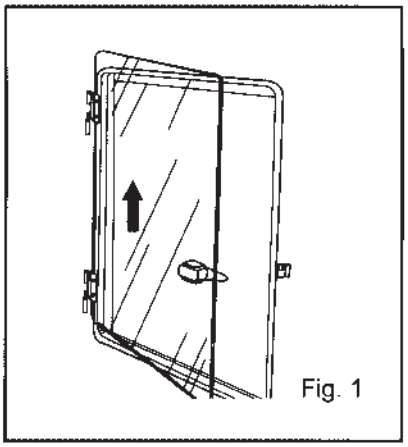


Fig. 1

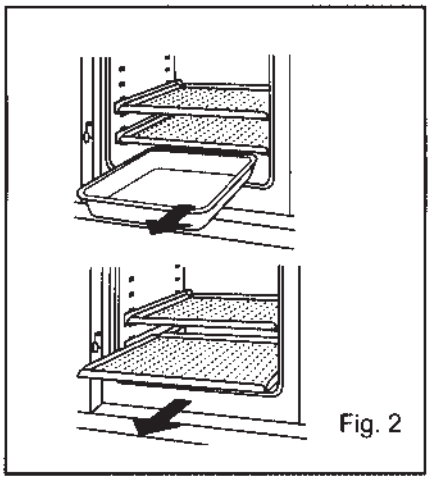


Fig. 2

4. [MCO-15AC] First remove all tray supports. Next, remove the top panel after removing the fixing screws. Then after removing the screws, take off all side supports. See Fig. 4

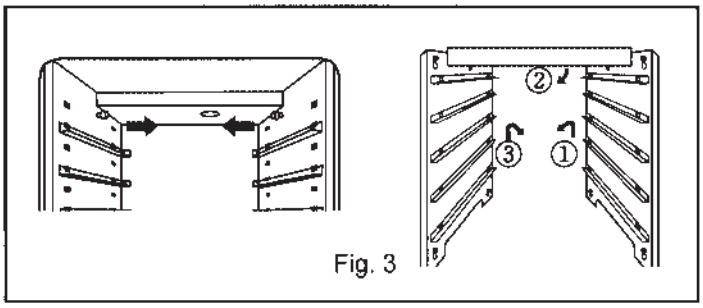


Fig. 3

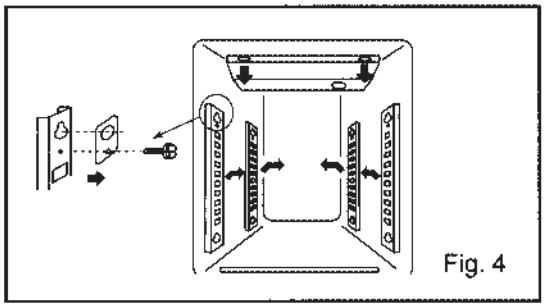


Fig. 4

5. Pull the spring in the center of the fun downwards and remove it as shown in Fig. 5.

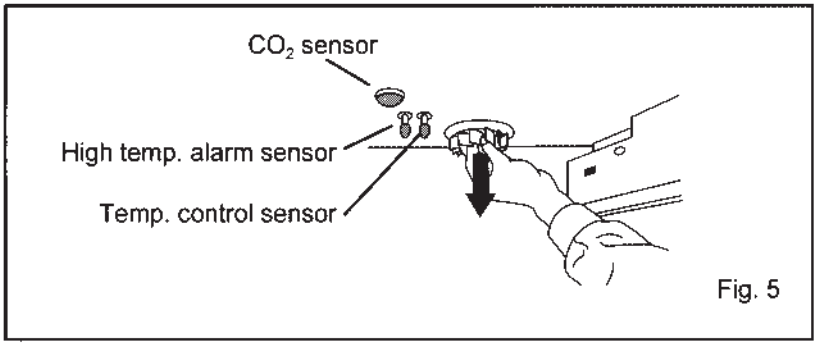


Fig. 5

CALIBRATION

Temperature calibration

1. Press the CAL key for 5 seconds.
2. The third digit of the temperature indicator flashes, and the CO_2 density indicator goes out.
3. Set the present correct temperature with the ▶▶ key and ▲ key, then press the ENT key.
4. The unit automatically reverts to the display mode.

[Example]
If the displayed chamber temperature is 37.0°C (set value) and the actual temperature is 36.8°C.
1. Press the CAL key for about 5 seconds.
2. The "3" on the temperature indicator flashes, and the CO_2 density indicator goes out.
3. Adjust the set value to the actual value of 36.8°C with the▶▶ key and▲ key, then press ENT key.
4. The unit automatically reverts to the display mode.

Note:
It is important to accurately measure the temperature inside the unit when performing temperature calibration. Particularly, the temperature gauge used must have an accuracy of 0.5 Class or better. The temperature must be measured at several points.
The temperature setting must not change by more than ±1.0°C during calibration. If it exceeds this, an error tone is emitted, the input data is ignored, and the unit reverts to the display mode. Consequently, if it is necessary to change the temperature by more than 1.0°C, perform calibration in several stages over a period of time.

CO_2 calibration

[Zero setting]
Zero setting should be done when CO2 has not been injected yet and the stable condition (about 8 hours) of temperature/humidity inside the unit has been attained.

1. Press the CAL key for 5 seconds.
2. The third digit on the temperature indicator flashes, and the CO_2 density indicator goes out.
3. Press the CAL key once again.
4. The third digit on the CO_2 density indicator flashes, and the temperature indicator goes out.
5. Set 00.0 with the ▶▶ key and ▲ key, then press the ENT key.
6. The unit automatically reverts to the display mode.

[Span setting]
Span setting should be done under stable condition of temperature, humidity, and CO_2 density.

1. Press the CAL key for about 5 seconds.
2. The third digit on the temperature indicator flashes, and the CO_2 density indicator goes out.
3. Press the CAL key once again.
4. The third digit on the CO_2 density indicator flashes, and the temperature indicator goes out.
5. Set the present correct CO_2 density with the ▶▶ key and ▲ key, then press the ENT key.
6. The unit automatically reverts to the display mode.

Note:
This calibration is available when the setting of CO_2 density is 2% or more.
Use sample air outlet to measure the present correct CO_2 density.

[Example]
For an internal CO_2 density of 5.0% (setting) and a measured value of 4.5%.

1. Press the CAL key for about 5 seconds.
2. The third digit on the temperature indicator flashes, and the CO_2 density indicator goes out.
3. Press the CAL key once again.
4. The third digit on the CO_2 density indicator flashes, and the temperature indicator goes out.
5. Set the present correct CO_2 density (4.5%) with the ▶▶ key and ▲ key, then press the ENT key.
6. The unit automatically reverts to the display mode.

SPECIAL FUNCTION

This function enables the various functions and parts of the unit to be checked and changes. This function affects its performance, so **do not use this function, except for a special case**. If this is the case, please contact you sales representative.

1. Press the CAL key for 5 seconds.

2. The third digit on the temperature indicator flashes, and the CO_2 density indicator goes out.

3. Set the third digit to F with the ▲ key.

4. Set the remaining digits to the desired function number with the ▶▶ and ▲ keys.

5. Confirm that there are no errors, then press the ENT key.

As a result of the above operations, the various function data appears on the CO_2 density indicator. If a change is necessary, press the ENT key to store the new data. If no change is necessary, wait for about 90 seconds, and the unit return automatically to the present value display mode.

F00 ROM version number indication.

F01

First digit: Not used.

Second digit: When 0, a normal indication is obtained. For control 1, the demo mode is activated. The set values are also displayed in the main heater, door, gasket heater off, CO2 off, display mode. All alarms are cancelled.

Third digit: Not used.

F02

Used to set the output ratio of the bottom heater with respect to the other heater. This function influences the basic performance. Therefore, contact your sales representative about the details.

Effective only when the value of the first digit of the CO_2 density indicator is between 0 and 9. Each time the numerical value increases by 1, the output ratio will increase.

F05

CO_2 sensor output voltage indication. The A/D converter input voltage (V) of the CO_2 sensor output is displayed on the CO_2 density indicator.

F06

Outer temperature indication. To indicate the present temperature sensor. (ambient temperature)

F09

All reset operation. In normal use, do not use.

TROUBLE SHOOTING

If the unit malfunctions, check out the following before calling for service.

The unit does not operate at all

1. The unit is not plugged correctly into a power outlet. The rating of the outlet is not adequate.
2. The circuit breaker of power source is active.
3. The power failure has occurred.

The key operation is disable

1. The key lock function is set in OFF.

If the alarm function operates

If the alarm function and the buzzer operates, check the cause using the following procedure.

[At the beginning of operation]

1. The chamber temperature is not equal to the set value.
2. The chamber CO_2 density is not equal to the set value.
   a. The secondary pressure of the pressure regulator is not equal to the set value (0.03Mpa).
   b. The tube is not connected securely between the pressure regulator and the unit.

[During operation]

1. The upper limit alarm temperature is not set at least 1°C higher than the set chamber temperature.
2. The set temperature value was changed, or the door was left open for a long period. A low temperature load was placed inside the unit. In this case, if the unit is left as it is, the alarm will eventually clear itself.
3. The gas tube has slipped off.
4. The set value of the gas density was changed.
5. The CO_2 gas cylinder is empty. Check the primary pressure of the CO_2 gas cylinder once a week.

If the chamber temperature is not equal to the set temperature

1. The temperature in the vicinity is too high. The ambient temperature must always be at least 5°C less than the set temperature.
2. The outer door was closed while the inner door was left open?

If the gas density does not coincide with the set value

1. The secondary pressure is set to 0.03Mpa?
2. The gas tube is clogged.

If the chamber humidity does not rise

1. The humidifying pan is not filled with sterile distilled water. (Always use the sterile distilled water.)
2. The humidifying pan is not placed in proper direction? The shorter sides are positioned front and back.

If the CO_2 consumption is too much

1. The door is opened frequently.
2. There is any gas leakage at the connection or pin hole on the tube. It is recommended to replace the tube once a year.
3. The gasket of inner door is not completely sealed.
4. The access port at the upper left corner is opened.

If normal cultivation cannot be done and chamber gas density is suspect

1. The environment around the unit is not normal. The source of the contaminated gas is nearby.
2. The unit is installed in an enclosed space.

If it takes much time to recover the gas density

1. HEPA filter is provided in the gas piping. If it takes much time to recover the gas density even though the gas pressure is normal, it seems that the dust on the HEPA filter prevents the gas flow. Consult the shop or us.

ENVIRONMENTAL CONDITIONS

This equipment is designed to be safe at least under the following conditions (based on the IEC 1010-1):

1. Indoor use;

2. Altitude up to 2000 m;

3. Ambient temperature 5°C to 40°C

4. Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C;

5. Mains supply voltage fluctuations not to exceed ±10% of the nominal voltage;

6. Other supply voltage fluctuations as stated by the manufacturer;

7. Transient overvoltages according to Installation Categories (Overvoltage Categories) II; For mains supply the minimum and normal category is II;

8. Pollution degree 2 in accordance with IEC 664.

DISPOSAL OF UNIT

⚠WARNING

If the unit is to be stored unused in an unsupervised area for an extended period **ensure that children do not have access and doors cannot be closed completely.**
The disposal of the unit should be accomplished by appropriate personnel. Always remove doors to prevent accidents such as suffocation.

SPECIFICATIONS

Name	CO_2 Incubator
Model	MCO-15AC
External dimensions	W620 x D685 x H900 (mm)
Internal dimensions	W490 x D505x H665 (mm)
Effective capacity	164 L
Exterior	Acrylic finish baked on galvanized steel
Interior	Stainless steel containing copper
Outer door	Acrylic finish baked on galvanized steel
Inner door	Tempered glass
Tray	Stainless steel containing copper 3 (standard), 15 (maximum)
Access port	Inner diameter; 30 mm, On the back side
Insulation	Rigid polyurethane foamed-in place (CFC-FREE)
Heating system	DHA (heater jacket + air jacket system)
Heater	Total 404 W
Humidifying system	Natural evaporation with humidifying pan
Temperature controller	PID control
Temperature display	Digital display
CO_2 controller	ON-OFF control system
CO_2 density display	Digital display
Air circulation	Stir up of breeze
Air filter	0.3 μ m, Efficiency; 99.97%
Alarm	Temperature alarm, CO_2 density alarm, Upper limit temperature alarm, Door alarm
CO_2 connecting inlet	4 to 6 mm diameter tube
CO_2 pressure	0.03 Mpa
Accessories	3 trays, 3 sets of tray support, 1 gas tube, 1 humidifying pan
Weight	78 Kg
Optional component	CO_2 pressure regulator (MCO-100L), Stainless tray (MCO-45ST), Stack kit (MCO-17PS)

Note: Design or specifications will be subject to change without notice.

PERFORMANCE

Model	MCO-15AC
Usable environment condition	Temperature; 0°C to 35°C, Humidity; equal or less than 80% R.H.
Temperature control range	Ambient temperature +5°C to 50°C (ambient temperature; 5°C to 35°C)
Temperature distribution	±0.2°C* (ambient temperature; 25°C, setting; 37°C, 5%, no load)
Temperature variation	±0.1°C (ambient temperature; 25°C, setting; 37°C, 5%, no load)
CO_2 control range	0 to 20%
CO_2 variation	±0.15% (ambient temperature; 25°C, setting; 37°C, 5%, no load)
Chamber humidity	95±5% R.H.
Maximum power consumption	380 W
Total maximum current	3.2 A (AC 110 to 120 V) 1.6 A (AC 220 to 240 V)
Maximum heat emission	1368 kJ/h
Noise level	33 dB (A scale)

Note : The unit with CE mark complies with EC directives 89/336/EEC, 93/68/EEC and 73/23/EEC.

* It is based on our measuring method.

⚠ CAUTION

Please fill in this form before servicing.
Hand over this form to the service engineer to keep for his and your safety.

Safety check sheet

1. Refrigerator contents : ☐Yes ☐No
   Risk of infection: ☐Yes ☐No
   Risk of toxicity: ☐Yes ☐No
   Risk from radioactive sources: ☐Yes ☐No

   (List all potentially hazardous materials that have been stored in this unit.)
   Notes :

2. Contamination of the unit
   Unit interior ☐Yes ☐No
   No contamination ☐Yes ☐No
   Decontaminated ☐Yes ☐No
   Contaminated ☐Yes ☐No
   Others:

3. Instructions for safe repair/maintenance of the unit
   a) The unit is safe to work on ☐Yes ☐No
   b) There is some danger (see below) ☐Yes ☐No
   Procedure to be adhered to in order to reduce safety risk indicated in b) below.

Date :
Signature :
Address, Division :
Telephone :

Product name :	Model :	Serial number :	Date of Installation :
CO_2 incubator	MCO-15AC		

Please decontaminate the unit yourself before calling the service engineer.

SANYO

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